Amendments to the Specification

1. Please replace paragraph [0011] with the following paragraph:

[0011] As illustrated in FIG. 1, ~~The~~ the present invention uses a method of ablation laser-machining, comprising: Step 100 generating 1 to 50 MHz pulses by one or more semiconductor-chip laser diodes, each pulse having a pulse-duration less than three picoseconds; Step 110 directing a less than one square mm beam of the pulses to a work-piece with an ablating pulse-energy-density; and Step 130 scanning the beam with a power-driven scanner to ablate a scanned area at least 25 times larger than the beam area.

2. Please insert the following paragraphs [0013.1] and [0013.2] between paragraphs [0013] and [0014]:

BRIEF DESCRIPTION OF THE DRAWINGS

[0013.1] FIG. 1 is a flowchart illustrating the method used in ~~one~~ various embodiments of the invention.

[0013.2] FIG. 2 is a block diagram of a system implementing ~~one~~ various embodiments of the invention.

3. Please insert the following paragraph [0016.1] between paragraphs [0016] and [0017]:

[0016.1] In the embodiment illustrated in FIG. 2 and discussed in further detail below, a system 200 may comprise a semi-conductor chip diode 210, a semiconductor optical amplifier 220, a dispersive element for compression 230, a scanning element 240, and optionally, a cauterizing laser 250 and an LED 260.

4. Please replace paragraphs [0017] and [0018] with the following two paragraphs:

[0017] Further, due to the small diameter of the laser beam, relative motion (e.g., vibration) between the laser beam and the work-piece can prevent successive pulses from

overlapping properly and movement such as vibration can cause uneven ablation. Note that uses such as surgical procedures can use surface ablation or cutting, and can use overlapping ablation to produce a cut surface. In all such uses, a train of pulses is preferably generated by one or more semiconductor-chip diodes, e.g. semiconductor-chip diode 210. The train of pulses allows a quasi-CW operation that improves system efficiency, e.g., lessening the number of current up-ramps and down-ramps. A cutting-line of laser-produced ablation (including in the circumference a circle of ablation to cut out a large hole) can be produced. There are, however, applications where a single laser-produced hole completely penetrating a work-piece is desired. The very high repetition-rates greatly reduce interference from vibration or other undesired motion.

[0018] In one embodiment the scanning can be accomplished by the use of a small piezoelectric driven mirror, e.g. scanning element 240. This scanning element can be small and fit in a dry erase pen size device and dither the focal spot across a larger spot such as a two (2) millimeter diameter region. A two (2) mm region can be identified, e.g., by a visible light source such as a red LED (Light Emitting Diode), e.g. LED 260, imaged on the surface of the biomaterial. The scanning mirror can have two operational modes. One mode is where the ablating light is scanned across the entire two (2) mm diameter region making a circular cut. The second mode is when the cut is made in a two (2) mm long, 100 μm wide stripe. The initial device can use a reasonably long focal length imaging element to permit a reasonable working distance. The beam is scanned across the tissue and removing the material in a nearly painless manner with virtually no residual damage, but the cut region may have bleeding since the ultra short pulse (USP) does not cauterize the region. In the case of an unacceptable level of bleed is induced in the removal region a second laser diode ~1W QCW GaAs laser can be used to cauterize the region, e.g. cauterizing laser 250. Since the USP laser and the cauterizing laser operate at approximately the same wavelength they can use the same optical beam train and imaging system, including drive steering mirror. The cauterizing laser may be triggered manually.

5. Please replace paragraph [0024] with the following paragraph:

[0024] It should be noted that this method works especially well with semiconductor-chip diodes. Semiconductor-chip diodes can have high efficiency (e.g., about 50%) and have short energy-storage-lifetimes (e.g., a few nanoseconds). With a small, e.g., 20 micron spot, the ablating energy can be furnished by a single semiconductor optical amplifier (SOA) putting out less than 10 micro-Joules per pulse (low energy density also limits collateral damage) e.g. semiconductor optical amplifier 220. The other types of lasers (e.g., a Ti:sapphire amplifier pumped by a Nd:YAG laser, which is in turn pumped by flash-lamps or pump diodes) generally have energy-storage-lifetimes (e.g., in the hundreds of microsecond range), which is convenient for accumulating energy and releasing it in a short period of time as a high-energy pulse. The Ti:sapphire/Nd:YAG-type lasers have generally been used for generating short, high energy pulses, but the efficiencies are very low (generally less than 1%) and the pulse energies drop off rapidly when operated at high repetition rates (when they begin to heat up, and when time between pulses becomes short and starts to reduce the time for accumulating energy for the next pulse). Conversely, semiconductor optical amplifiers can provide a microsecond long train of pulses of nearly constant energy with nanosecond spacings. Thus, while other types of lasers could be used, semiconductor-chip diodes are preferred. Note however, that fiber amplifiers, especially when operated at high repetition rates, or solid-state optical amplifiers that can be directly pumped by pump diodes (e.g., Cr:YAG amplifiers) may also be used.

6. Please replace paragraph [0026] with the following paragraph:

[0026] Additionally, the SOAs have an energy storage lifetime on the order of a few nanoseconds. The nanosecond energy storage lifetime allows the stretch pulses to be amplified effectively and have constant energy per pulse and achieve maximum repetition rates above 50 MHz. Repetition rates above about 100 MHz would see the decrease in the energy per pulse as most solid-state lasers do at repetition rates >1 KHz. Another benefit to the SOAs is the ability to use conventional thermal management schemes and off-the-shelf drive circuitry with a moderate average power requirement and high efficiencies. Once the stretched pulse is amplified, the optical pulses are then recompressed giving a high intensity pulse with a pulse width in the femtosecond regime.

The compression can be accomplished by using a dispersive element, e.g. dispersive element for compression 230, that acts as a spectral filter, thereby delaying one end of the spectrum so that the spectrum is compressed into a very narrow temporal slot. If one stretches a pulse to 20 ns, amplifies it and then recompresses it to a 200-fs pulse width, the final amplification peak power is reduced by a factor of 10^5, without decreasing final pulse power. The longer pulse and lower amplitude drive current combine to reduce the thermal spikes in the quantum well to a few degrees Celsius and dramatically reduces the resistive losses at the contact.